Federal and State Policy Aspects of Louisiana Industrial Decarbonization

Industrial Decarbonization Special Session Part 1

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B2 E2
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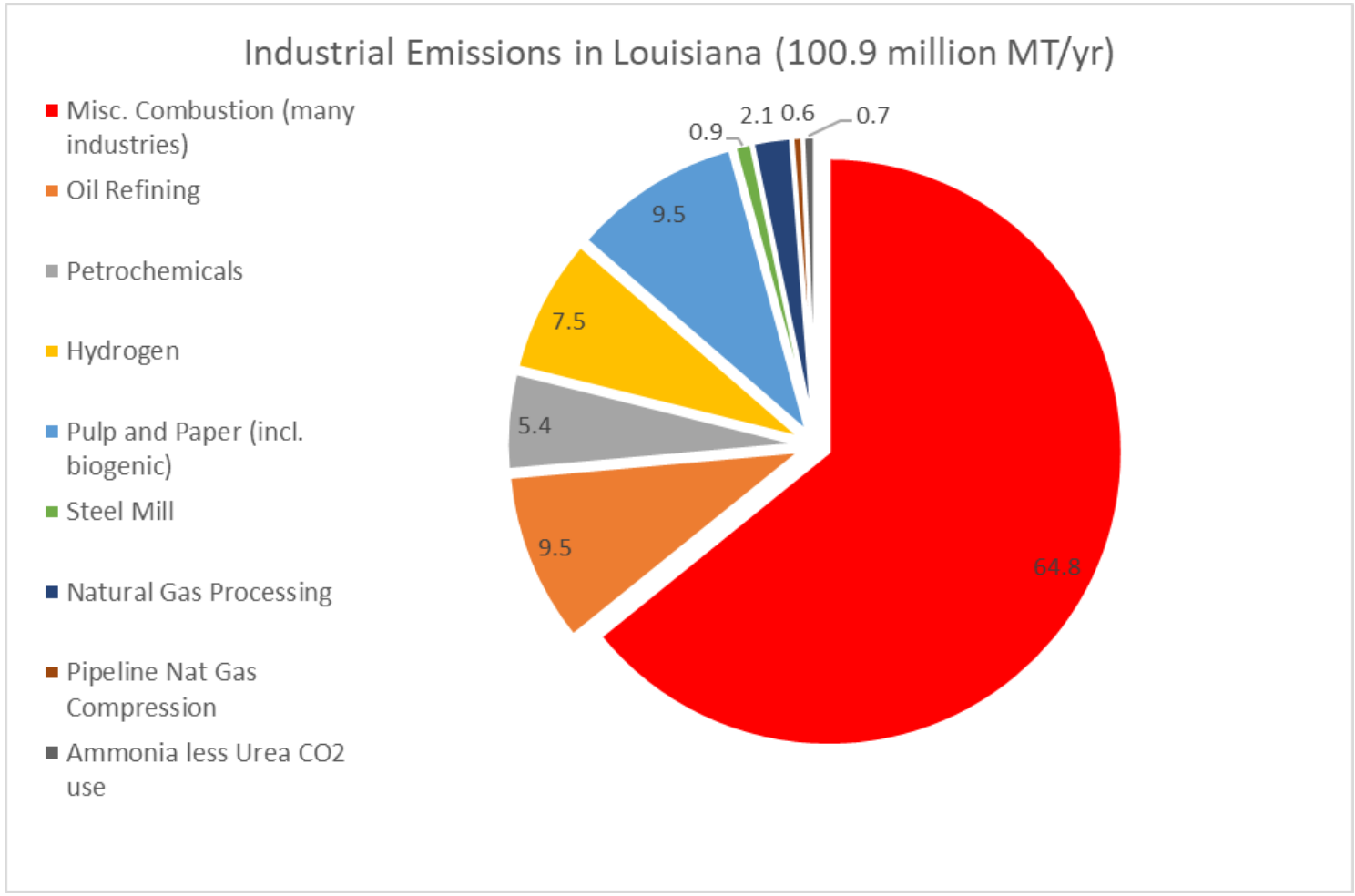
Takeaways

- Three key tools for industrial decarbonization: carbon capture, fuel switching, and electrification.
- In the absence of a carbon tax or a compliance-based regime of CO2 emissions limits for existing, already-permitted industrial emitters, the sole source of cash to cover cost of CCS, switching, or electrification is federal incentives.
- There is a significant ($50/MT) federal incentive for CCS. There is no federal incentive for electrification or fuel switching.
- State policies can decrease risk and/or state tax burden, aiding any of the three tools.
- In comparison to other states I have scrutinized, Louisiana's existing emissions appear harder (from a techno-economic standpoint) to address through fuel switching and electrification, and comparatively easier to address through carbon capture. So CCS may be cheaper, as well as being better incentivized.

Louisiana Industrial Emissions



Carbon Capture and Storage: Overview

- A major slice (i.e., 50%+) of Louisiana's existing industrial CO2 emissions appear to be susceptible to CCS technically.
- A federal $50/MT credit exists and may be strengthened for CCS—some environmental groups pushing for $85/MT up from $50/MT.
- State regulatory policies can derisk these projects, and state tax policies can cut capital/operating costs.
- In the absence of sales of CO2 to Enhanced Oil Recovery operations (relatively small industry in Louisiana), carbon capture is utterly dependent upon government cash or tax credits to pay for the cost of CO2 abatement.

Break-Evens for CCS in Various Industries

- About 31% of LA Industrial CO2 is from high concentration sources that are close to economically feasible for CCS (top three rows below).
- The other 69% is roughly $20-$25/MT underwater economically.
- More federal incentives, plus help from State could improve the situation for the 69%. And CCS is likely cheaper than electrification or fuel switching (discussed below).

		Market			COSTS					($50)
Capture & Compression Capital Cost Drivers	Capacity Factor Drivers	Examples	Approx MT/yr CO2 in Louisiana	%	Capture $/MT	Com-pression $/MT	Transport $/MT	Geologic Seques-tration $/MT	Total	Less $50 tax credit assuming fully usable (negative result means profit)
Pure CO2%--No capture needed (but typically quite small size)	High NCF	ethanol, nat gas process, leftover CO2 in ammonia/urea plants	3	3%	-	18	3	5	$ 26	($24)
High CO2 ~15-25% (process & combustion)	High NCF	steam methane reformer, fluid cat cracker, pulp mill black liquor	26	26%	35	10	3	5	$ 53	$3
Med CO2 ~13% (combustion only)	High NCF	petcoke boilers for industrial heat	2	2%	40	10	3	5	$ 58	$8
Low CO2% (combustion only)	High NCF	natural gas- or Refinery Fuel Gas-fired industrial CHP or heat; natural gas compressors	70	69%	55	10	3	5	$ 73	$23

State Role on CCS Incentives

- Reduction of risks:
  - Siting of pipelines is crucial. Giving eminent domain authority to CO2 intrastate pipelines is crucial.
  - State primacy and expedient action on siting of Class VI wells for geologic storage, plus State role in post-injection long-tail environmental liabilities

- Reduction of costs:
  - Reduced severance taxes for oil produced in tertiary recovery using anthropogenic CO2.
  - Reduced (local) property taxes on capture equipment
  - Sales tax reduction to zero on purchase of capture equipment.

Industrial Combustion Emissions (Mostly EPA GHG Subpart "C") in Louisiana

Misc. Combustion by Industry	MT/yr ^6	% of Total	Comments on Fuel Switching and Electrification Potential
Oil Refining	22.07	34%	Mostly free refinery fuel gas
Petrochemicals	13.20	20%	Mostly natural gas
Pulp and Paper (excl. biogenic)	1.91	3%	Natural gas, petcoke, tire derived fuels, some fuel substitution potential
Natural Gas Processing	3.34	5%	Mostly natural gas
Pipeline Nat Gas Compression	2.85	4%	Mostly natural gas, equipment could be replaced with electric compressors
Offshore Oil & Gas	4.20	6%	Likely mostly natural gas, difficult to electrify
LNG	5.49	8%	Natural gas. 8% for electricity. Balance refrigeration and compression
Ammonia	3.88	6%	Mostly natural gas
Total of Identifiable Misc. Combustio	56.95	88%	

- No federal incentive for fuel switching or electrification.
- Very little use of super high-emitting, carbon intensive fuels in Louisiana. Mostly natural gas and refinery fuel gas.
- Some pet coke and tire derived fuels used in one or two pulp mills for process heat: could be replaced with natural gas.
- When fuel is nearly free and low-carbon (refinery fuel gas) it is hard to see how the state could address with electrification.
- Some potential for electrifying natural gas-fired turbines, compressors, and refrigeration at LNG and pipelines with newly decarbonized grid electricity. Would require entirely replacing existing equipment (see LNG above) and would vastly increase energy charge.

Drilling Down on Policies for Fuel Switching and Electrification

- Here, Julio Friedmann of Columbia is estimating that switching from NG heat to electric heat would cost ~$100/ton of Ammonia.
- Just for CF Industries (4.3 million tons/NH3) that would be $430 million/year.
- Renewable hydrogen: $1.6Bn/year.
- Where would LA get that money?

Figure 11: Cost increase per ton of ammonia, assuming 3.5 $/MMBtu natural gas as original heat source